



## Raised temperatures over the Kericho tea estates: Revisiting the climate in the East African highlands malaria debate

---

**Author(s):** Omumbo JA, Lyon B, Waweru SM, Connor SJ, Thomson MC  
**Year:** 2011  
**Journal:** Malaria Journal. 10: 12

---

### Abstract:

**BACKGROUND:** Whether or not observed increases in malaria incidence in the Kenyan Highlands during the last thirty years are associated with co-varying changes in local temperature, possibly connected to global changes in climate, has been debated for over a decade. Studies, using differing data sets and methodologies, produced conflicting results regarding the occurrence of temperature trends and their likelihood of being responsible, at least in part, for the increases in malaria incidence in the highlands of western Kenya. A time series of quality controlled daily temperature and rainfall data from Kericho, in the Kenyan Highlands, may help resolve the controversy. If significant temperature trends over the last three decades have occurred then climate should be included (along with other factors such as land use change and drug resistance) as a potential driver of the observed increases in malaria in the region. **METHODS:** Over 30 years (1 January 1979 to 31 December 2009) of quality controlled daily observations ( > 97% complete) of maximum, minimum and mean temperature were used in the analysis of trends at Kericho meteorological station, sited in a tea growing area of Kenya's western highlands. Inhomogeneities in all the time series were identified and corrected. Linear trends were identified via a least-squares regression analysis with statistical significance assessed using a two-tailed t-test. These 'gold standard' meteorological observations were compared with spatially interpolated temperature datasets that have been developed for regional or global applications. The relationship of local climate processes with larger climate variations, including tropical sea surface temperatures (SST), and El Nino-Southern Oscillation (ENSO) was also assessed. **RESULTS:** An upward trend of approximately 0.2 degrees C/decade was observed in all three temperature variables ( $P < 0.01$ ). Mean temperature variations in Kericho were associated with large-scale climate variations including tropical SST ( $r$  Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.50;  $p < 0.01$ ). Local rainfall was found to have inverse effects on minimum and maximum temperature. Three versions of a spatially interpolated temperature data set showed markedly different trends when compared with each other and with the Kericho station observations. **CONCLUSION:** This study presents evidence of a warming trend in observed maximum, minimum and mean temperatures at Kericho during the period 1979 to 2009 using gold standard meteorological observations. Although local factors may be contributing to these trends, the findings are consistent with variability and trends that have occurred in correlated global climate processes. Climate should therefore not be dismissed as a potential driver of observed increases in malaria seen in the region during recent decades, however its relative importance compared to other factors needs further elaboration. Climate services, pertinent to the achievement of development targets such as the Millennium Development Goals and the analysis of infectious disease in the context of climate variability and change are being developed and should increase the availability of relevant quality controlled climate data for improving development decisions. The malaria community should seize this opportunity to make their needs heard.

Source: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3031277>

## Resource Description

### Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

### Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, El Nino Southern Oscillation, Temperature, Other Exposure

**Temperature:** Fluctuations

**Other Exposure:** sea surface temperatures

### Geographic Feature:

resource focuses on specific type of geography

Other Geographical Feature

**Other Geographical Feature :** highlands

### Geographic Location:

resource focuses on specific location

Non-United States

**Non-United States:** Africa

**African Region/Country:** African Country

**Other African Country:** Kenya

### Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

**Infectious Disease:** Vectorborne Disease

**Vectorborne Disease:** Mosquito-borne Disease

**Mosquito-borne Disease:** Malaria

### Medical Community Engagement:

resource focus on how the medical community discusses or acts to address health impacts of climate change

A focus of content

# Climate Change and Human Health Literature Portal

## **Mitigation/Adaptation:**

mitigation or adaptation strategy is a focus of resource

Adaptation

## **Model/Methodology:**

type of model used or methodology development is a focus of resource

Exposure Change Prediction

## **Resource Type:**

format or standard characteristic of resource

Research Article

## **Timescale:**

time period studied

Short-Term (

## **Vulnerability/Impact Assessment:**

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content